REPORT

SCENARIO PLANNING EXERCISE
CONSIDERING MOOSE MANAGEMENT OBJECTIVES FOR NEW YORK

Thursday, September 10, 2015

Location: DEC Office, Ray Brook, NY

Attendees: Jeremy Hurst (NYDEC), Ben Tabor (NYDEC), Chris Lassell (NYDEC), Ed Reed (NYDEC), Steve Heerkens (NYDEC), Shawn Reynolds (NYDEC-lands), Sharon Tabor (NYDEC), Alec Wong (Cornell), Heidi Kretser (WCS), Michale Glennon (WCS), Nina Schroch (BRI), Erika Rowland (WCS); On phone/webinar: Krysten Schuler (Cornell), Angela Fuller (Cornell/USGS), Paul Schuette (SUNY).

Introduction

After an absence throughout much of the 20th century, moose began to re-colonize New York and other southerly sections of their historic range over the last 30 years (Wattles and DeStefano 2011), including the Adirondack Park and surrounding areas. Sightings by the public and private forest land owners and road and other mortalities have confirmed its presence in the state, but total number, density, and distribution remain unknown for New York. High densities coupled with health and productivity issues in adjacent states and provinces have prompted New York Department of Environmental Conservation (NYSDEC) wildlife biologists/managers to initiate research to address questions about the moose population in northern New York and to help determine how moose should be managed in upcoming decades, under its current status as a species of greatest conservation need (SGCN) or as a game species similar to adjacent jurisdictions.

Given the uncertainties about the outcomes of the research efforts just getting underway and other drivers in the region that influence current and future habitat and management conditions for moose, including emerging concerns about climate change, NYSDEC managers convened a scenario planning exercise at the DEC office in Ray Brook, New York to do some anticipatory thinking around moose and their management needs over the next 10-20 years. Fifteen individuals engaged in moose research and management around the Adirondack Park participated in the one-day meeting, facilitated by Erika Rowland.

The objectives for the scenario-planning exercise were to:

1. Refine a set of future scenarios for the Adirondacks describing potential future conditions (e.g., land use/habitat availability, social perceptions, climate) for moose management.
2. Identify alternative objectives and strategies/actions for moose management in NY linked to different futures to position the state agency to respond to unfolding issues as ongoing research efforts yield information about moose population numbers and distribution.

The full agenda of the meeting can be found in Appendix A. The meeting is part of a larger project funded by the USGS National Climate Change and Wildlife Science Center piloting the use of scenario planning in support of wildlife management in the Northeast.

Preliminary management scenarios, revisions, and comments

The meeting began with a presentation by Paul Schuette, in which he shared the current understanding of moose population size, distribution and status based on updated results of recent research in New York and information from the surrounding region.

The next portion of the meeting included a presentation on the preliminary management scenarios by Erika Rowland. These management scenarios covered a 2025-2030 timeframe and were developed in advance of the meeting. These initial scenarios were based on information synthesized from several meetings and workshops related to a regional Northeast scenario planning effort that have taken place since its start in early 2015: 1) a moose and climate science synthesis workshop in February, 2) New York moose research meeting in May, 3) the Northeast moose group meeting in July, and 4) a regional climate scenario building meeting with Northeast Climate Science Center researchers in August. DEC wildlife biologists identified several categories of uncertainties relevant to management planning for moose in New York that were used as the framing for scenario development:

- Moose population-distribution, density, & total numbers;
- Moose population-productivity & health;
- Habitat availability/forest regeneration practices;
- Public opinion-hunting, road mortality, viewing opportunities, and industry attitudes about browse damage.

The key uncertainties relating to moose in this exercise are the near-term trend in the total moose population and its distribution in the Adirondacks and surrounding region of New York, and whether its' population is stable, increasing, or declining. How these uncertainties unfolded in each supplied the theme/title for each of the three preliminary scenarios:

1. WHAT YOU SEE IS WHAT YOU GET
This scenario reflects a stable moose population through the 2030s with the ultimate findings of the NY moose research matching the preliminary results of the ongoing efforts.

2. TOO MUCH OF A GOOD THING
This scenario captures the current conditions and future impacts that would support and result from an expanding moose population.

3. EASY COME, EASY GO
In this scenario, moose populations peaked in the 2000s and have begun a decline in overall numbers that will continue and be exacerbated by changes in the region through the 2030s.

The scenarios were distributed to participants for review in advance of the meeting. Much of the morning was spent recording suggested changes to the scenarios and other comments. The revised scenarios are captured in Tables 1-3.

Table 1. Description of the "What you see is what you get" scenario.

Identified Uncertainties	Scenario: What you see is what you get
Moose population-distribution, density, & total numbers	Estimates of moose population numbers around 500+ are confirmed by research over next 5 years; distribution is focused on working forest conservation easements, with highest densities in northern part of park. Population numbers are stable, but there is little movement of animals beyond the current sites because of the limited availability of forage outside of timberlands.
Moose population-productivity & health	Detections of winter tick are insignificant in NY, despite their abundance in other states & provinces in the northeast. Other health issues linked to white-tailed deer continue at low levels, as winter conditions continue to keep deer densities generally low. Neospora (parasite) is also detected. Overall, moose productivity is steady, resulting in a stable and healthy population.
Habitat availability/forest regeneration practices	Type of landownership and market forces affecting timber harvest remain fairly stable over the next 10 years. Lyme Timber Company & Forest Land Group continue harvest practices for forest products that provide adequate early successional, hardwood browse. Conifer forest remains stable; no budworm or woody adelgid outbreaks occur that reduce conifer.
Political situation and public opinion on hunting, road mortality, viewing opportunities	Road mortality of moose remain at levels that reflect the declines over the last 5 years (~4 per year) and are acceptable to the public. But some disappointment at the lack of viewing opportunities is expressed, particularly as year-round residents and recreational use of the region increases. Browse levels on timberlands is becoming problematic, particularly for high quality products, as moose concentrate in and around the regenerating forests. The issuance of nuisance permits for take over several years on affected lands results in critical opposition over take rather than trap and transport. Political situation is neutral with regard to moose. Hunting culture in these areas

	relatively stable.

Additional Comments	• Public and DEC staff reports of moose sightings beyond northern working forest conservation easement lands are concentrated in:
	  ○ SW corner of ADK park
	  ○ SE corner, Desolation Lake
	  ○ Tug Hill
	  ○ Adirondack League Club, Moose River Plains
	  ○ Wilderness and forest preserve lands (more people than in CEs, more sightings?)
	• Nathan Crumb's occupancy modeling using hunter survey data suggest conifer cover is a key predictor of moose presence (firearm season-fall).
	• One suggestion was that moose on harvested private lands and in conifer-dominated wilderness represent two groups with different dynamics, but this was not strongly supported.
	• Discussion of current deer numbers: Population is relatively low given that the age of the forest in the ADK could likely support more. One reason for this might be that winter severity is high and currently trumps forage availability.

Table 2. Description of the "Too much of a good thing" scenario.

Identified Uncertainties	Scenario: Too much of a good thing (Moose on the loose)
Moose population-distribution, density, & total numbers	Moose population levels are higher then preliminary estimates suggested (1000++) and growing (these were limited by detection in conifer types), as determined by scat detection and other methods. Very high concentrations are found around working forest ands and in other areas. These sites support the greatest increases over the next decade. There is movement of moose around the state (outside the ADK).

Moose population-productivity & health	By the early 2020s winter tick has taken hold in areas (e.g., timberlands) where moose densities are greatest. Despite increasing parasites and disease, productivity shows no signs of decline by the 2030s.
Habitat availability/forest regeneration practices	In the late 2010s industrial forest landowners are adjusting harvest methods to those that generate more early successional forest in response to browsing and biomass opportunities in some regions (e.g., Region 6). This, in turn, enhances forage availability for moose, and, initially bolsters population numbers around these lands. By the 2030s natural disturbance processes, such as extensive windthrow, have also created large areas of young forest in the mostly even-aged preserve.
Political situation and public opinion on hunting, road mortality, viewing opportunities	Moose viewing opportunities are on the rise, which the public views positively. But concerns continue to pour into DEC (with some suggesting carnivore reintroductions to reduce numbers). Although limited in extent, moose road mortalities are on the rise, raising concerns for human safety. While the increasing browse damage (with higher densities) is not important for biomass, it is also negatively affecting the quality of other forest products and the case for opening a hunting season is made by the public. By the 2020s there is increasing political support for population management. With this comes the potential for top down pressure from government because of public safety concerns (moose-human conflict).
Additional Comments	• Much of the current timber management on the ADK forest lands is for quality hard (sugar and red?) maple products, but prices are at some of their lowest. • Moose browse red maple. Shorter rotation harvests and/or larger clearcuts (limited by APA clearcut restrictions) to "swamp" effect of moose browsing may be a response. • The private, hunt club culture may be/is on the decline. Exclusive hunting via leases on private lands. Subject to NY state hunting regulations??? • Chipping currently is more prevalent on forest industry lands in the northern parts of the ADK

	park than biomass harvest, in part due to the location and capacity of biomass facilities. • Many private lands (>50 ac) are enrolled in/subject to NY tax law 488.

Table 3. Description of the "Easy come, easy go" scenario.

Identified Uncertainties	Scenario: Easy come, easy go
Moose population-distribution, density, & total numbers	Research over the next few years indicate that moose populations in NY probably peaked around the late 2000s (coinciding with the maximum road mortalities) and, starting soon after 2015, are on the decline. While pockets of moose occur around the working forest lands, a variety of detection methods show little evidence of individuals beyond these sites.
Moose population-productivity & health	While initial studies suggest that moose in the Adirondacks are in good condition, declines become evident over the next decade, linked to the spread of related parasites and disease to moose. Continued declines in moose numbers and condition in NH, VT, and Ontario slow/shut down additional colonization to bolster NYs decreasing population.
Habitat availability/forest regeneration practices	The expansion of spruce budworm from the north and east and hemlock wooly adelgid from the south, coupled with a series of years with severe ice damage and road washouts (exceeding maintenance budgets) from severe rain events through the end of the 2010s and into the 2020s causes major changes in forest practices. Such extreme changes in forest conditions result in the withdrawal of many properties from the Green Forest Certification Program. Increased prevalence of forest pests and change in harvest practices that result in declining habitat quality for moose. Expansion of public access (e.g., snowmobile trail system in and around Mount Lion) in northern areas may eventually impact moose.

Political situation and public opinion on hunting, road mortality, viewing opportunities	Conservation groups and NY-DEC are concerned at the nearing extirpation of moose from the state. But, in light of other natural resource and economic issues, there is little funding to support action and few ideas about how to recover the population, particularly since deer continue to be a nuisance. Public awareness and interest in moose is mixed, as it has been a decade or more since it was common to catch a glimpse of one in the Adirondacks. Political interest regarding looming extirpation may steer DEC into ultimately intervening.
Additional Comments	None.

After revising the three prepared scenarios, the group took some time to consider if there were major drivers and/or additional scenarios that might be important to the discussion of management objectives and actions. Some drivers that were mentioned included:

- Development patterns-regional land use plans & policies, increase in year-round residents;
- Incentives for conservation (e.g., working forest-Green Forest Certification Program, NY 488 tax law, additions to the forest preserve); and
- Immigration/emigration patterns linked to moose density effects in other states and provinces across the Northeast.

We also briefly discussed a "Moose on the loose" scenario, in which moose became a significant nuisance in urban and suburban settings. Ultimately participants decided that this was a variation of and potential implication for the "Too much of a good thing" scenario.

Applying the scenarios toward management objectives and actions

Participants spent the afternoon grappling with how the alternative future scenarios might influence management objectives and the strategies and actions required to achieve them.

After considering the first scenario, the group determined that the broad goals outlined would be roughly the same for each scenario. The broad goal categories noted as common to wildlife management plans included:

1. Maintain current population level or encourage population growth;
2. Monitor (and promote, in some cases if possible) moose health;
3. Promote active public use of moose resource;
4. Promote public awareness of moose;
5. Mitigate nuisance issues.

And, while the objectives would differ to varying degrees between scenarios, the group decided that developing specific, measurable, achievable, realistic, and time-bound (SMART) objectives might be unrealistic in the absence of key information about the moose population and limited time. We instead identified how the goals and related objectives might differ qualitatively and offered examples of what kinds of actions might be taken in response (Table 4).

Climate scenarios for 2025-2049

The final portion of the day focused on considering developing climate scenarios for 2025-2049 of relevance to the moose management issues discussed earlier in the day. Again, Erika Rowland presented this information and facilitated the discussion.

Historic and projected climate information and its interaction with moose across the northern forest of the Northeast had been summarized and discussed at several meetings over the last 6 months (see list above). Seminal information about climate links specific winter tick-related die-offs in Alberta, Canada are captured in Samuel et al. (2007). Concerns regarding the potential effects of climate change on moose are both direct and indirect. They range from heat stress across several seasons due to warming temperatures to the influence of changing conditions on parasite and disease dynamics, as well as the

response of forest managers to changes in disturbance regimes and operational constraints.

For this scenario planning exercise the aim was to identify uncertain climate variables most relevant to moose in northern New York and develop climate scenarios around their projected changes for the time period of 2025-2050 to explore their implications for moose management. The responses outlined for the nearer-term management scenarios are to be examined against the climate futures to consider what adjustments might be needed.

Time was limited for the climate scenario portion of the exercise at the September 10th meeting. Erika Rowland shared a summary of recent work on developing climate scenarios for the Northeast and climate data for northern New York (e.g., minimum winter temperature, spring snow cover-SWE, and seasonal projections for maximum temperature and precipitation), primarily from the USGS National Climate Change Viewer (http://www.usgs.gov/climate_landuse/clu_rd/apps/nccv_viewer.asp). Participants decided that preliminary climate scenarios be built around winter snow depth and minimum temperatures or a winter severity index (NYDEC) for moose and the duration of snow cover in the spring.

Several additional steps are recommended to more fully develop and apply the material generated at the initial meeting in September.

1) Create preliminary climate scenarios based on snow depth and winter temperatures (October 2015);
2) Circulate of the revised management scenarios, preliminary climate scenarios, and summary of identified management responses to group for review and comment;
3) Host a phone call to consider the implications of the climate scenarios and other materials (late October/early November 2015);
4) Schedule a meeting aimed at developing SMART objectives for the combined scenarios (Jeremy & Ben re: who) (early January 2016);

5) Draft management-like plan or other document to serve as its informational basis (early winter 2016);
6) Circulate management plan support document for review and revision based on additional research results;
7) Finalize management plan support document and create power point to document process (spring 2016).

Table 4. Potential management responses identified for each near-term scenario at the meeting at NYSDEC office in Ray Brook, NY on September 10, 2015.

Goals/objectives	Scenario WHAT YOU SEE IS WHAT YOU GET	Scenario: TOO MUCH OF A GOOD THING	Scenario: EASY COME, EASY GO
1. Maintain current population level or encourage population growth;	• Under this scenario, there may not be a plan to manipulate population levels (i.e., promote or reduce), unless there is a demand for sport hunting or the need to reduce browse impacts on forest industry lands.	• Reduce moose populations – compatible with human interests and habitat conditions. • Strategy/actions: Social research toward understanding "how much is too much" threshold. • Coordinate with other states to establish population management objectives to maintain healthy populations prior to disease or parasite outbreaks.	• Sustain/bolster moose populations, if possible or politically motivated. • Strategy/actions: Establish causal factors for decline through research and coordination with other states and NGOs. Management actions will depend on the results to determine whether moose extirpation is inevitable or not. If not, actions might include supplementing the NY moose population from other parts of the Northeast (e.g., Quebec); paying landowners to promote moose habitat (e.g., some private groups/landowners are paid $8/acre for clearcutting to support grouse); conduct research to identify "good things" that landowners can do (e.g., establish recreation "no go" zones in key moose habitat on easement lands).
2. Monitor (and promote?) moose health;	• Strategy/actions: Continue to establish baseline conditions through current and additional research efforts. Work with other states to standardize sampling etc. for monitoring trends and regional comparisons.	• Strategy/actions: Continue to establish baseline conditions through current and additional research efforts. Work with other states to standardize sampling etc. for monitoring trends and regional comparisons. • Modify moose monitoring to focus on clinical assessments of abnormalities. • Use harvests for moose health assessments.	• Strategy/actions: Integrate with research associated with #1. It will be important to understand what is going on in NY, as well as the regional context.

3. Promote active public use of moose resource;	• Promoting a hunting season would probably not be desired under this scenario, but, there could shared benefits for forest industry and wildlife management from improving moose viewing opportunities on the managed private lands.	• Obtaining authority to set a hunting season and bag limits would be necessary under this scenario (permits through lottery, stamps, others?). • Use moose lottery to bolster research on other species and management opportunities. • Moose stamp for research (legislative). • Private enterprise?	• Not a goal under this scenario.
4. Promote public awareness of moose	• Currently there are some that are not aware that there are moose in New York. This would mostly focus on general information about the species, unless a decision is made to address forest browse issues with hunting beyond nuisance permits issued to individual landowners. • Strategy/actions: Public outreach plan to anticipate potential resistance to hunting – 2 pronged approach fostering and highlighting collaboration between forest and wildlife managers. Create wildlife-viewing opportunity near clearcuts as public outreach (option of including interpretive exhibits or phone-based app).	• This goal and related objectives would be met in concert with #3 use of resource and #5 nuisance issues focused on benefits and coexistence. • Sample objective: • Strategy/actions: Public outreach plan to anticipate potential resistance to hunting – 2 pronged approach fostering and highlighting collaboration between forest and wildlife managers (maybe even DOT in this one). • Create wildlife-viewing opportunity near clearcuts as public outreach (option of including interpretive exhibits or phone-based app). • Manage and mitigate for MVA (along roads) and HMC in suburban and urban areas-outreach plans.	• Public outreach focused on ramifications of factors influencing moose decline • Strategy/actions: Public outreach plan might include topics, such as, highlighting the radeoffs of deer vs moose density or forestry practices (dependent on research); encouraging landowners to manage their land to support moose ("do good things"-need to identify what these might be).
5. Mitigate nuisance issues.	• Moose browse in regenerating stands is a concern expressed by forest managers on the conservation easement lands in the northern part of the Adirondack Park. It is unclear, though, what the acceptable thresholds are and if they vary	• Moose browse in regenerating stands is a concern expressed by forest managers on the conservation easement lands in the northern part of the Adirondack Park. It is unclear, though, what the acceptable thresholds are and if they vary	• With a declining moose population, nuisance complaints will likely go down (but may go up if disease-related). Strategy: Explore non-lethal options for nuisance mitigation.

	among species. • Strategy/actions: Establish thresholds for browse damage. Develop options for lethal and non-lethal mitigation. This might initially include research to evaluate options. Options might include: herbivory capture, exclosure fencing, take (nuisance permits, hunting season combined with research option/necropsy on carcasses), habitat management (relaxing clearcut size restrictions to "swamp" browsers), young forest initiative actions on non-industry lands, and financial compensation for damage.	among species. • Strategy/actions: Establish thresholds for browse damage. Develop options for lethal and non-lethal mitigation. This would require research to evaluate options. Options might include: herbivory capture, exclosure fencing, take (nuisance permits, hunting season combined with research option/necropsy on carcasses), habitat management (relaxing clearcut size restrictions to "swamp" browsers), young forest initiative actions on non-industry lands, and financial compensation for damage. Focus hunting on specific areas as a means of mitigating nuisance issues. • Coordinate with other state agencies (DOT) for signage and, maybe, overpasses. • Agricultural nuisance issues: cattle, crops • CWD monitoring as per deer.	

Appendix A. Agenda for NY-DEC Scenario Planning Exercise

Scenario Planning Exercise:
Considering moose management objectives for New York

Thursday, September 10, 2015

Location: DEC Office, Ray Brook, NY

Meeting Objectives:

3. Develop/refine a set of future scenarios for the Adirondacks describing potential future conditions (e.g., land use/habitat availability, social perceptions, climate) for moose management.
4. Identify alternative objectives and strategies/actions for moose management in NY linked to different futures to position the state agency to respond to unfolding issues as ongoing research efforts yield information about moose population numbers and distribution.

Agenda

8:30 AM	Introductions & review meeting objectives and outline of day
9:00 AM	Brief presentation(s) of background information • Project • Moose in NY and regional context
9:30 AM	Introduce & revise management scenarios
11:00 AM	Consider management implications (challenges/opportunities) of each
12-12:30 PM	Lunch**
1:00 PM	Identify management objectives and response options (strategies, specific actions) for each management scenario
2:30 PM	Introduce & apply climate scenarios (2025-2049) to test objectives and management responses
4:00 PM	Wrap up and discussion of next steps (e.g., a brief report of the meeting, additional research/monitoring needs identified through the SP process, consideration of another exercise with broader stakeholder group, public perception survey)

**Please bring a lunch or be prepared to pick one up